Percentages of forecasts verified, January, 1890.

States.		States.	
Maine	84.0	Kentucky	84.1
New Hampshire	84.1	Ohio	84.5
Vermont	84.2	West Virginia	84.9
Massachusetts	86.1	Indiana	87.7
Rhode Island	83.7	Illinois	85.3
Connecticut	80.4	Lower Michigan	85.3
Eastern New York	83.0	Upper Michigan	82.1
Western New York	82.4	Wisconsin	84.7
Eastern Pennsylvania	86.3	Minnesota	82.9
Western Pennsylvania	83.7	Iowa	84.1
New Jersey	81.9	Kansas	87.4
Delaware	82.5	Nebraska	83.4
Maryland	84.4	Missouri	85.0
District of Columbia	85.7	Colorado	82.8
Virginia	87.4	North Dakota	78.7
North Carolina	88.5	South Dakota	81.7
South Carolina	87.2	Southern California*	88.3
Georgia	89.1	Northern California*	86.9
Eastern Florida	95.2	Oregon*	90.8
Western Florida	94.3	Washington*	87.8
Alabama	89.5	*By elements:* Weather	85.8
Mississippi	86.8	Temperature†	84.5
Louisiana	87.0		
Texas	90.2	Monthly percentage of weather and temperature combined‡	85.3
Arkansas	87.5		
Tennessee	84.1		

* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The forecasts of temperature in districts east of the Rocky Mountains for January, 1890, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. ‡ The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

FORECASTS FOR 48 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for forty-eight and seventy-two hours, covering the second and third days in advance. Such forecasts are optional with the predicting officer, and are only made when clearly in the public interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications of forecasts made for second day in advance. Number of predictions made: weather, 2; temperature, 51. Percentages of verifications: weather, 100; temperature, 85.7. Weather and temperature combined, 86.5.

No forecasts for seventy-two hours were made during the month.

CAUTIONARY SIGNALS FOR JANUARY, 1890.

Statement showing percentages of justifications of wind signals for the month of January, 1890:

Wind signals.—(Ordered by Captain H. H. C. Dunwoody.) Total number of signals ordered, ninety; justified as to velocity, wholly, seventy-six, partly, four; justified as to direction, eighty-three. Of the signals ordered, sixty-two were cautionary, of which fifty-two were wholly, and two partly, justified; and twenty-eight were storm signals, of which twenty-four were wholly, and two partly, justified. Sixteen signals were ordered for easterly winds, of which twelve were justified, and seventy-four were ordered for westerly winds, of which seventy-one were justified. Percentage of justifications, 74.7.

Cold-wave signals.—(Ordered by Assistant Professor T. Russell.) Total number of signals ordered, three hundred and ninety-five; justified, two hundred and sixty-three. Percentages of justifications, 66.6.

Percentages of local verifications of weather and temperature signals reported by directors of the various State Weather Services for January, 1890.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Indiana	83.0	85.0	New Jersey	86.9	88.2
Kansas	88.9	91.0	New York	88.5	84.0
Michigan	82.4	75.5	Ohio	88.0	86.0
Minnesota	81.0	82.0	Pennsylvania	85.0	83.0
Missouri	86.0	85.0	South Carolina	80.0	87.8
Nebraska	89.8	91.8			

STATE WEATHER SERVICES.

[*Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.*]

The following extracts and summaries are republished from reports for January, 1890, of the directors of the various state weather services:

ALABAMA.

The weather was spring-like throughout the month, and the rainfall was small for a winter month.

Temperature.—Highest monthly mean, 63, at Citronelle; lowest monthly mean, 49, at Valley Head; maximum, 84, at Citronelle, 7th; minimum, 17, at Elkmont, 22d; greatest local monthly range, 58, at Citronelle and Elkmont; least local monthly range, 44, at Mobile.

Precipitation.—Greatest monthly, 6.33, at Tuscumbia; least, 0.60, at Mobile.

Wind.—Prevailing directions, south and southwest.—*P. H. Mell, Signal Corps, Auburn, director.*

ARKANSAS.

Temperature.—The average was 8.1 higher than for January, 1889. Highest monthly mean, 56.2, at Washington; lowest monthly mean, 40.2, at Winslow; maximum, 81, at Lead Hill, 26th; minimum, 10, at Winslow, 16th.

Precipitation.—The average precipitation was one inch greater than that of last year. Greatest monthly, 9.46, at Ozone; least monthly, 3.97, at Fort Smith.—*M. F. Locke, Commissioner of Agriculture, Little Rock, director; W. U. Simons, Sergeant, Signal Corps, assistant.*

COLORADO.

Temperature.—The monthly mean for the state was 4 above the average of the last three years. Highest monthly mean, 33.4, at Cañon City; lowest monthly mean, 4.5, at Gunnison; maximum, 84, at Breckenridge; minimum, —39, at Gunnison; greatest local monthly range, 110, at Breckenridge; least local monthly range, 45, at Moraine.

Precipitation.—The monthly precipitation was about the average; greatest monthly, 2.08, at Durango; least monthly, 0.00, at Monte Vista.

Wind.—Prevailing direction, west.—*Prof. F. H. Loud, Colorado Springs, director; W. S. Miller, Corporal, Signal Corps, assistant.*

ILLINOIS.

Temperature.—The mean temperature for the month was 10 above the normal of the past fifteen years; maximum, 74, at Jordan's Grove, Mascoutah, and McLeansborough, 12th; minimum, —13, at Woodstock, 22d.

Precipitation.—The average for the month was about 3.37 above the normal of the past twelve years; greatest monthly, 14.62, at Atwood; least monthly, 1.64, at Sycamore.

Wind.—Prevailing direction, northwest.—*John Craig, Sergeant, Signal Corps, Springfield, in charge.*

INDIANA.

Temperature.—The month was warm throughout; the mean temperature is the highest on record for any month of January for the last nine years, except January, 1880, which was warmer; highest monthly mean, 45.7, at Marengo; lowest monthly mean, 33.5, at Logansport; maximum, 72, at Scalesville, 11th; minimum, —3, at La Fayette, 24th; greatest local monthly range, 73, at LaFayette; least local monthly range, 51, at Marengo.

Precipitation.—The precipitation, mainly in the form of rain, was greatly in excess, in fact the amounts are the greatest ever measured in Indiana in any January on record; the average excess above the normal is 3.76; greatest monthly, 11.90, at Huntingburgh; least monthly, 2.48, at Logansport.

Wind.—Prevailing direction, southwest.—*Prof. H. A. Huston, La Fayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.*

IOWA WEATHER CROP BULLETIN SERVICE.

Temperature.—Highest monthly mean, 28.9, at Keokuk; lowest monthly mean, 11.2, at Larrabee; maximum, 64, at Keokuk, 11th; minimum, —27, at Fayette, 22d; greatest local monthly range, 81, at Glenwood; least local monthly range, 56, at Maquoketa.

Precipitation.—Greatest, 3.80, at Grinnell; least, 0.99, at Larrabee.

Wind.—Prevailing direction, northwest.—*G. M. Chappel, Sergeant, Signal Corps, Des Moines, in charge, Iowa Weather Crop Bulletin Service.*

KANSAS.

Temperature.—The mean temperature for the month was 2 above the normal; highest monthly mean, 37.8, at Oswego; lowest monthly mean, 19.4, near Concordia; maximum, 79, at Englewood, 9th and 30th; minimum, —22,

at Seneca, 16th; greatest local monthly range, 88, at Scott City; least local monthly range, 60, at Buffalo Park; greatest daily range, 57, at Gove City, 1st; least daily range, 3, at Dodge City, 12th, and at Kellogg, 26th.

Precipitation.—Greatest, 3.73, at Marmaton; least, 0.10, at Weskan.

Wind.—Prevailing direction, northwest.—*Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.*

KENTUCKY.

The month was characterized by an excess of rainy and cloudy days.

Temperature.—The temperature was 10 above the normal for the month; maximum, 77, at Pellville, 4th; minimum, 10, at Owenton, 22d; greatest monthly range, 58, at Pellville, Richmond, and Louisville; least monthly range, 50, at Franklin.

Precipitation.—Greatest, 7.69, at Murray; least, 3.66, at Ashland.

Wind.—Prevailing direction, south.—*Dr. E. A. Grant, Louisville, director, Frank Burke, Sergeant, Signal Corps, assistant.*

LOUISIANA.

Temperature.—The average temperature was nearly 14 above the January normal for the northern section, and a little over 10 for the southern section. Highest monthly mean, 66.8, at New Iberia; lowest monthly mean, 56.4, at Farmerville; maximum, 88, at Convent, 27th; minimum, 21, at Minden, 16th; greatest local monthly range, 59, at Amite; least local monthly range, 30, at Port Eads.

Precipitation.—The deficiency in northern Louisiana is about 0.25, and in southern Louisiana a little over 4.00; greatest, 8.38, at Coushatta; least, 0.61, at Thibodeaux.

Wind.—Prevailing direction, south.—*R. E. Kerkam, Sergeant, Signal Corps, New Orleans, in charge.*

MICHIGAN.

The features of the month are the high temperature, excess in rainfall, and the lack of snowfall in the central and southern portions of the state.

Temperature.—The mean temperature was 7.6 above the normal of fifteen years; highest monthly mean, 36.7, at Benton Harbor; lowest monthly mean, 12.6, at Atlantic; maximum, 68, at Williamston, 16th; minimum, —20, at Crystal Falls, 22d; greatest local monthly range, 64, at Williamston; least local monthly range, 34, at Gaylord; greatest daily range, 46, at Gulliver Lake, 18th; least daily range, 0, at Ypsilanti, 6th.

Precipitation.—The average for the month was 1.17 above the normal of fifteen years; greatest, 5.90, at Atlantic; least, 1.41, at Hayes.

Wind.—Prevailing direction, southwest.—*N. B. Conger, Sergeant, Signal Corps, Lansing, director.*

MINNESOTA.

In the southeastern part of the state, and at Moorhead, the temperature was about 2 above the normal, while in other portions of the state it was from 2 to 3 colder than usual. The precipitation was greatly in excess at Saint Vincent; there was a considerable deficiency at Moorhead; in other portions of the state the departures were not remarkable.

Temperature.—Highest monthly mean, 16.8; lowest monthly mean, —9.3, at Saint Vincent; maximum, 49, at Mankato; minimum, —38, at Saint Vincent, 7th and 21st, and at Pokegama Falls, 16th; greatest local monthly range, 88, at Pokegama Falls; least local monthly range, 61, at Rolling Green.

Precipitation.—Greatest, 1.98, at Saint Vincent; least, 0.10, at Morris.

Wind.—Prevailing direction, northwest.—*John Healy, Private, Signal Corps, Saint Paul, in charge.*

MISSISSIPPI.

Temperature.—The mean temperature for the month was 11.4 above the normal; maximum, 88, at Summit, 10th; minimum, 20, at Louisville, 17th. The daily range of temperature was generally small, being less than 10 on eight days, and less than 16 on twenty days.

Precipitation.—The rainfall was very unequally distributed, the northern section getting nearly its normal, while the southern section received very much less than the normal amount.

Wind.—Prevailing direction, south or southeast—*R. B. Fulton, Signal Corps, University, director.*

MISSOURI.

Temperature.—Maximum, 81, at Protem; minimum, —16, at Langdon.

Precipitation.—The greatest rainfall occurred along the Missouri and Mississippi rivers from New Haven to Genevieve, and southwestwardly from the latter place to Ironton, both of which report 10.5. The rainfall decreased to the west and northwest parts of the state to from 2.00 to 3.00.—*Prof. Francis E. Nipher, Saint Louis, director.*

METEOROLOGICAL REPORT OF THE MISSOURI STATE BOARD OF AGRICULTURE.

The month was noted for the high temperature and excessively heavy rains.

Temperature.—The temperature ranged from 8 in the northern, to 12 in the southern, portion above the normal for January; Highest monthly mean, 45.6, at Protem; lowest monthly mean, 21.8, at Oregon; maximum, 81, at Protem, 26th; minimum, —19, at Conception, 11th; greatest local monthly range, 81, at Oregon; least local monthly range, 56, at Warrenton, Kans.

Precipitation.—Greatest, 10.50, at Ironton and New Haven; least, 1.27, at Leavenworth, Kans.

Wind.—Prevailing direction, south.—*Levi Chubbuck, Secretary of State Board of Agriculture, Columbia, director; A. L. McRae, Sergeant, Signal Corps, assistant.*

NEBRASKA.

Temperature.—The month opened and closed with mild pleasant weather, and cold weather prevailed from the 12th to the 24th; maximum, 72, at Mullen; minimum, —34, at Fort Niobrara.

Precipitation.—Over 2.00 fell in the southeastern portion of the state, from 1.00 to 2.00 in the east-central portion, and less than one inch in the remainder of the state, including a small area in Saunders and adjacent counties.—*Prof. Goodwin D. Swezey, Crete, director; G. A. Loveland, Sergeant, Signal Corps, assistant.*

NEVADA.

Temperature.—The month has been characterized by low temperature and heavy snow. The mean temperature for the state is 2.7 below the normal; maximum, 73, at El Dorado Canyon, 28th; minimum, —42, at Elko; these extremes were very severe on all stock on the ranges throughout the northern portion of the state.

Precipitation.—The precipitation was generally in the form of snow and very heavy, except in the southern portion of the state, where light rain occurred. The average for the state was 1.59 above the normal for the month; greatest, 9.30, at Ruby Hill; least, 0.49, at El Dorado Canyon.

Wind.—Prevailing direction, south.—*Prof. Chas. W. Friend, Carson City, director; H. E. Wilkinson, Corporal, Signal Corps, assistant.*

NEW ENGLAND METEOROLOGICAL SOCIETY.

The weather in New England during January may be characterized as cloudy, very warm, and dry. The average temperature for January for twenty-five stations, having records for more than ten years, was 5.4 above the normal.

Temperature.—Highest monthly mean, 37.9, at Block Island; lowest monthly mean, 16.0, at Fairfield; maximum, 69, at Olneyville, 12th; minimum, —23, at Orono, 10th; greatest local monthly range, 81, at Orono; least local monthly range, 39, at Nantucket; greatest daily range, 56, at West Milan, 25th; least daily range, 0, at Calais, 16th.

Precipitation.—Greatest, 4.66, at West Milan; least, 1.26, at Shelton. The average precipitation for January for thirty-four stations, having records for more than ten years, was 1.17 below the normal.

Wind.—Prevailing direction, northwest.—*Prof. William H. Niles, Boston Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; L. G. Schultz, Sergeant, Signal Corps, assistant.*

NEW JERSEY.

Temperature.—The mean temperature for the month was 11.8 above the average; highest monthly mean, 45.3, at Cape May C. H.; lowest monthly mean, 37.1, at Madison; maximum, 78, at Cape May C. H., 12th; minimum, 12, at Highland Park, 22d; greatest local monthly range, 61.3, at Egg Harbor City; least local monthly range, 45.5, at New Brunswick; greatest daily range, 48, at Cape May C. H., 13th; least daily range, 0.5, at Princeton, 3d.

Precipitation.—The average for the month is 0.65 below the normal; greatest, 3.22, at Plainfield; least, 1.05, at Asbury Park.

Wind.—Prevailing directions, northwest and southwest.—*E. W. McGann, Sergeant, Signal Corps, New Brunswick, in charge.*

NEW YORK.

Temperature.—Maximum, 69, at West Point, 3d; minimum, —15, at Plattsburgh Barracks, 10th and 11th; greatest local monthly range, 79, at Plattsburgh Barracks; least local monthly range, 45.1, at Madison Barracks and Sacket's Harbor. The monthly mean temperature was everywhere above the normal.

Precipitation.—The rainfall was generally above the average, excepting in the Hudson Valley, where large deficiencies were reported; greatest monthly, 7.24, at Constableville; least monthly, 0.99, at Ardenia.

Wind.—Prevailing direction, west.—*Prof. E. A. Fuertes, Ithaca, director; I. W. Brewer, Private, Signal Corps, assistant.*

NORTH CAROLINA.

The mean temperature for the month was 10 above the normal, and the rainfall was 4.00 below the average.

Temperature.—Highest monthly mean, 57.2, at Wilmington and Blackman's Mills; lowest monthly mean, 41.7, at Highlands; maximum, 85, at Clarkton, 27th; minimum, 10, at Highlands, 17th; greatest local monthly range, 66, at Clarkton; least local monthly range, 41, at Southport and Hatteras.

Precipitation.—The rainfall was most abundant in the western portion of the state, but did not reach the normal there; greatest monthly, 4.68, at Chattanooga, Tenn; least monthly, 0.33, at Blackman's Mills.

Wind.—Prevailing direction, southwest.—*Dr. Herbert B. Battle, Raleigh, director; C. F. von Herrmann, Sergeant, Signal Corps, assistant.*

NORTH AND SOUTH DAKOTA.

Temperature.—The monthly mean temperature was 6 below the normal; highest monthly mean, 14.8, at Spearfish, S. Dak; lowest monthly mean, —9.3, at Saint Vincent, Minn; maximum, 59, at Valentine, Nebr., 30th; minimum, —40, at Gallatin, N. Dak; greatest local monthly range, 83, at Valentine, Nebr.; least local monthly range, 59, at De Smet, S. Dak; greatest daily range, 58, at Fort Buford, N. Dak., 24th; least daily range, 4, at Valentine, Nebr., 14th.

Precipitation.—The monthly average for the state was about 0.13 above the normal; greatest monthly, 2.10, at Spearfish, S. Dak.; least monthly, 0.00, at Millbank, S. Dak.—*S. W. Glenn, Sergeant, Signal Corps, Huron, in charge.*

OHIO.

Temperature.—This was the warmest January of which there is any record in the bureau. The mean temperature in the northern, middle, and southern

sections was 12.0, 12.3, and 12.3, above the average for the sections. The mean for the state was 12.2 above the average for January; maximum, 75, at Hanging Rock, 12th; minimum, 0.7, at Wauseon, 22d; greatest daily range, 49.3, at Toledo, 13th; least daily range, 3, at Columbus, 27th, New Alexandria, 6th, and Cleveland, 7th.

Precipitation.—The precipitation in the northern, middle, and southern sections was 1.22, 1.77, and 1.98 above the average for the sections. The mean for the state was the heaviest rainfall on record for January, and 1.66 above the average; the greatest monthly, 8.33, at West Milan, is the largest rainfall ever reported from a station of the bureau for January.—*Prof. B. F. Thomas, Columbus, director; Lieut. Charles E. Kilbourne, secretary; C. M. Strong, Corporal, Signal Corps, assistant.*

OREGON.

The month was remarkable for its general low temperature, and western Oregon for its excessive precipitation.

Temperature.—The mean temperature was 5.9 below the normal, the departures ranging from 3.3, at Albany, to 8.3, at The Dalles. Highest monthly mean, 38.9, at Gardiner; lowest monthly mean, 15.8, at North Powder; maximum, 60, at Pendleton, 29th; minimum, —24, at Jordan Valley, 7th.

Precipitation.—The average precipitation was 1.75 above the normal. It was greatly in excess in western Oregon, and slightly deficient in the eastern portion of the state; greatest, 21.86, at Gardiner; least, 1.13, at Heppner. The snowfall was unusually heavy—over six feet falling in Columbia county. Generally in western Oregon, save on the coast, from one to six feet fell.

Wind.—Prevailing direction, southwest.—*Hon. H. E. Hayes, Master State Grange, Oswego, director; B. S. Pague, Sergeant, Signal Corps, assistant.*

PENNSYLVANIA.

Temperature.—The mean temperature for the state was about 11 above the normal, which makes this the warmest January since 1880; greatest local monthly range, 67, at Blue Knob; least local monthly range, 46, at Annville, Catawissa, and Myerstown; greatest daily range, 44, at Chambersburgh, 12th; least daily range, 2, at Tipton, 7th; maximum, 77, at Coatsville, 12th; minimum, —2, at Blue Knob, 22d.

Precipitation.—The average was about 0.30 below the normal. The western part of the state received an excess, and the eastern portion a deficiency; greatest monthly, 6.87, at Clarion; least monthly, 1.47, at Bloomfield.

Wind.—Prevailing directions, west and northwest.—*Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant.*

SOUTH CAROLINA.

Temperature.—Highest monthly mean, 59.4, at Charleston; lowest monthly mean, 49.7, at Spartanburgh; maximum, 81, at Conway, 8th; minimum, 17, at Spartanburgh, 18th; greatest local monthly range, 62, at Spartanburgh; least local monthly range, 38, at Port Royal.

Precipitation.—Greatest monthly, 2.75, at Walhalla; least monthly, 0.28, at Port Royal.—*Hon. A. P. Butler, Columbia, director; J. W. Cronk, Private, Signal Corps, assistant.*

TENNESSEE.

The month was in many respects rather a phenomenal one. The high temperature during the first half, the mild weather during almost the entire month, the abnormal rainfall, the prevailing high winds, and the large percentage of cloudiness, all combined to render it a remarkable and very disagreeable month.

Temperature.—The mean temperature was 13 above the average for the past seven years; highest monthly mean, 53.4, at Cog Hill; lowest monthly mean, 46.1, at Rugby; maximum, 79, at Woodstock, 11th, and at Memphis, 12th; minimum, 16, at Rugby, 7th; this was the highest January minimum during the past seven years.

Precipitation.—Greatest monthly, 10.70, at Bolivar; least monthly, 2.90, at Greeneville.

Wind.—Prevailing direction, south.—*J. D. Plunket, M. D., Nashville, director; H. C. Bate, Signal Corps, assistant.*

TEXAS.

Temperature.—The abnormally high temperature of the two preceding months continued during January; a cold wave passed over the state during the 16th. The average temperature was considerably above the normal; the greatest departure was near the coast, where it was 12; from the coast it gradually decreased northward to the Panhandle, where it was 8. The mean temperature ranged from 38, at Hartley, to 69, at Brownsville; maximum, 84, at College Station, 29th, and at Gallinas, 31st; minimum, 2, at Hartley, 21st.

Precipitation.—The precipitation varied from 2.00 to 10.00 east of the ninety-eighth meridian, which is slightly in excess of the normal; between the ninety-eighth and one hundredth meridians the amount was less than fifty per cent. of the January normal, while west of this it ranged from 0.50 to 1.00, which is slightly in excess of the normal.—*D. D. Bryan, Galveston, director; I. M. Cline, Sergeant, Signal Corps, assistant.*

NOTES AND EXTRACTS.

COMPARISON OF ANEMOMETERS.

[By Assistant Professor C. F. MARVIN.]

In the MONTHLY WEATHER REVIEW for February, 1889, a brief account was given of experiments made upon a large whirling apparatus to determine the proper formula to be used with the Signal Service anemometer in order to accurately compute wind velocity.

With the very satisfactory results thus obtained from the whirling machine experiments as a basis for subsequent comparisons, it has been found that anemometers of different dimensions when exposed to the same wind do not give even approximately the same wind velocity. A brief study of this question was made about a year ago and the conclusion reached that anemometers having cups and arms of relatively considerable weight did not follow closely the sudden fluctuations of ordinary winds, and, in consequence, had a tendency to indicate too high a wind movement. More extended observation, involving the comparison of a much greater variety of anemometers, has shown that this peculiarity is not confined to heavy cups alone, but is exhibited by others as well.

Starting with accurate whirling machine experiments, the results obtained show that *anemometers exposed to the same wind those whose cups and arms are of slender proportions indicate a higher velocity than that shown by anemometers whose cups and arms are of compact proportions.* The terms slender and compact, in this connection, refer to the relation existing between the diameter of the cups and the length of the arms. Anemometers whose arms from the axis to the centres of the cups are nearly two or more times the diameter of the cups are considered as being of slender proportions, while those whose arms have a length only a little greater or even less than the diameter of the cups are said to be of compact proportions.

While the differences in the velocities indicated by the various anemometers may arise from the circumstance that on the whirling machine the anemometer is in motion while in the open air the air is, itself, in motion, yet such is not believed to be the case, but rather that the result is brought about by the gusty and violently fluctuating character of open air winds.

From a study of many detailed facts derived not only from open air comparisons, but also from whirling machine experiments, it is considered that, of the two classes, the anemometer of compact proportions indicates more nearly the actual wind movement. As the regular Signal Service anemometer is of comparatively slender proportions, it is therefore necessary to change, to some extent, the constants found from the whirling machine experiments, so that the indications of the anemometer in the gusty and fluctuating winds of the open air may be more nearly correct.

Notwithstanding that comparisons have been in progress for several weeks, yet there are so many disturbing elements entering into accurate investigation of this kind and the more or less complete elimination of which is of importance that, being obliged, also, to depend upon the weather for the range of velocities desired, it is found the data is still insufficient in some respects. However, the observations have been reduced and the constants of the Signal Service anemometer computed.

In attempting to compute corrections that may be used to reduce the wind velocities heretofore observed by the Signal Service to more accurate values, one is at once confronted by the most serious difficulties in that the highest velocities at which accurate experiments have been made are far below many of the observed velocities. Owing, moreover, to the very imperfect knowledge of a correct dynamic theory for the Robinson anemometer, the empirical formulæ ordinarily used cannot be depended upon for correct values for velocities beyond the experimental values. This fact is very evident from an inspection of the results given in the table below, which contains values deduced from different formulæ, commonly used by meteorologists in this connection. The formulæ used are as follows, and apply to the Signal Service anemometer having cups 4 inches in diameter on arms 6.72 inches long:

(*a*) $V = 3v$. Robinson formula.
(*b*) $V = .225 + 3.143v - .0362v$ (whirling machine).
(*c*) $V = .263 + 2.953v - .0407v$, (*b*) reduced to open air.
(*d*) $V = .466 + 2.525v$.
(*e*) log. $V = .509 - .9012$, log. v.

V is velocity of wind in miles per hour; v is velocity of centres of cups in miles per hour.

Velocity of wind, in miles per hour, as determined by various formulæ.

(a). Robinson factor.	(b). Quadratic (whirling machine).	(c). Quadratic (open air).	b + c.	(d). Right-line (open air).	(e). Logarithmic (open air).	Corrections.		
						d — a.	e — a.	c — a.
2.5	2.82	2.72	1.04	2.57	2.74	+ .07	+ 0.24	+ 0.22
5.0	5.36	5.07	1.06	4.68	5.12	— .32	+ 0.12	+ 0.07
10.0	10.30	9.65	1.07	8.88	9.56	— 1.12	— 0.44	— 0.35
15.0	15.04	14.01	1.07	13.09	13.77	— 1.91	— 1.23	— 0.99
20.0	19.57	18.14	1.08	17.31	17.85	— 2.69	— 2.15	— 1.86
25.0	23.90	22.05	1.08	21.51	21.82	— 3.49	— 3.18	— 2.95
30.0	28.04	25.72	1.09	25.71	25.72	— 4.29	— 4.28	— 4.28
35.0	*31.97	29.17	1.10	29.93	29.55	— 5.07	— 5.45	— 5.83
40.0	35.70	32.40	1.10	34.14	33.33	— 5.86	— 6.67	— 7.60
50.0	42.56	38.18	1.11	42.56	40.76	— 7.44	— 9.24	—11.82
60.0	48.62	43.04	1.13	50.98	48.03	— 9.02	—11.97	—16.96
70.0	53.87	47.00	1.15	59.39	55.19	—10.61	—14.81	—23.00
90.0	61.97	52.21	1.19	76.23	69.22	—13.77	—20.78	—37.79

*Highest velocity experimentally observed.